2.2L 4-CYL - VIN [4]

1994 GENERAL MOTORS ENGINES 2.2L 4-Cylinder

ENGINE IDENTIFICATION

NOTE: For engine repair procedures not covered in this article, see ENGINE OVERHAUL PROCEDURES - GENERAL INFORMATION article in the GENERAL INFORMATION section.

Engine may be identified by using Vehicle Identification Number (VIN), engine block code or partial VIN.

VIN is stamped on a metal pad, located near lower left corner of windshield. Eighth character of VIN identifies engine model ("4" identifies 2.2L MFI engine). Tenth character of VIN identifies model year ("R" indicates 1994 model year).

Engine build date (month and day) and engine code (3 characters) is stamped on left side of cylinder block near cylinder head. Code LN2 indicates 2.2L MFI engine.

Partial VIN (9 characters) is stamped on lower left side of cylinder block at cylinder block-to-transmission flange. See **Fig. 1** . First character ("1") of partial VIN identifies manufacturer as Chevrolet. Second character ("R") identifies model year as 1994.

ENGINE IDENTIFICATION CODES

Application	Engine Code	VIN Code
2.2L 4-Cylinder MFI	LN2	4

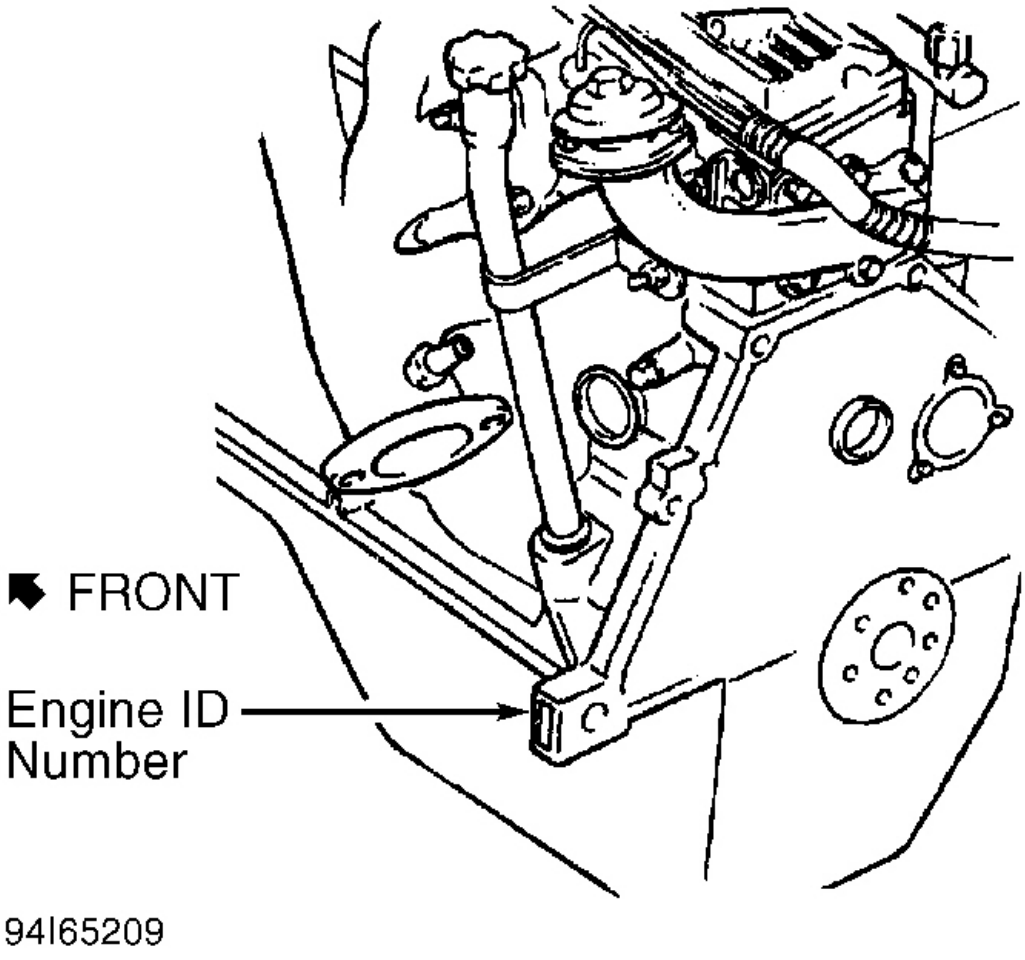


Fig. 1: Locating Engine ID Number
Courtesy of GENERAL MOTORS CORP.

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

Engine has hydraulic valve lifters; valve adjustment is not required.

TROUBLE SHOOTING

NOTE: To trouble shoot engine mechanical components, see appropriate table in TROUBLE SHOOTING article in GENERAL INFORMATION.

REMOVAL & INSTALLATION

GENERAL PRECAUTION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

NOTE: For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Also place mating marks on engine hood and other major assemblies before removal.

FUEL PRESSURE RELEASE

Loosen fuel tank filler cap to release tank vapor pressure (DO NOT tighten at this time). Remove fuel pump fuse. Start and run engine until engine stops. Engage starter for at least 3 seconds to ensure remaining fuel pressure is released. Disconnect negative battery cable. Reinstall fuel pump fuse. Some residual line pressure may exist. Cover fuel lines using shop towel before disconnecting.

ENGINE

Removal & Installation

1. Release fuel system pressure. See FUEL PRESSURE RELEASE. Disconnect negative battery cable. Disconnect under hood light. Disconnect vacuum reservoir from hood. Disconnect windshield washer line to hood. Remove outer cowl vent grilles. Remove hood and raise vehicle.
2. Drain engine oil and cooling system. Discharge A/C system using approved refrigerant recovery/recycling equipment (if equipped). Remove oxygen sensor. Disconnect exhaust at manifold and loosen hanger at converter.
3. Remove pencil braces from engine to transmission. Remove inspection cover. Remove starter motor. Remove engine mount through bolts. Remove bell housing bolts and lower vehicle.
4. Remove battery from vehicle and disconnect body ground. Remove upper and lower fan shrouds and remove fan. Remove serpentine belt. Remove upper radiator hose. Remove A/C compressor (if equipped) and lay aside. Remove lower radiator hose.
5. Remove radiator. Disconnect P/S lines at pump. Disconnect heater hoses from the intake and coolant pump. Disconnect wiring harness from engine. Disconnect vacuum lines, throttle cable and fuel lines.
6. Support transmission. Install engine hoist and raise engine. Remove left side engine mount and remove engine from vehicle. To install, reverse removal procedure.

INTAKE MANIFOLD (UPPER & LOWER)

Removal

1. Release fuel system pressure. See FUEL PRESSURE RELEASE. Disconnect negative battery cable. Remove air intake duct. Remove MAP sensor and EGR solenoid valve. Disconnect necessary vacuum hoses, electrical connections and fuel lines from upper intake manifold. Remove upper intake manifold bolts and remove upper intake manifold.
2. Disconnect wiring and fuel lines from lower intake manifold. Disconnect plug leads from DIS coil pack. Remove lower intake manifold nuts. Remove lower intake manifold and gasket.

Installation

To install, reverse removal procedure using NEW gaskets. Tighten nuts in sequence to specification. See TORQUE SPECIFICATIONS. See **Fig. 2** and **Fig. 3** . Fill cooling system.

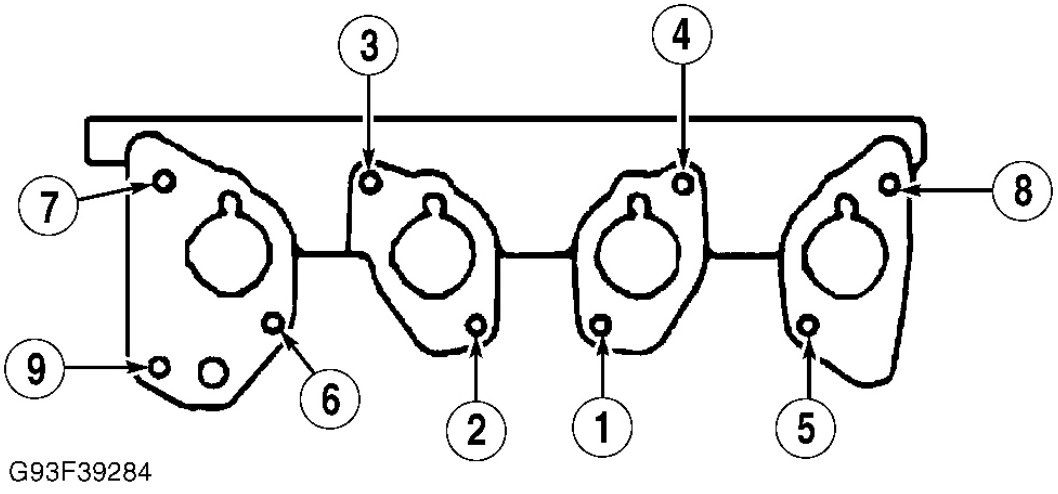


Fig. 2: Lower Intake Manifold Nut Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

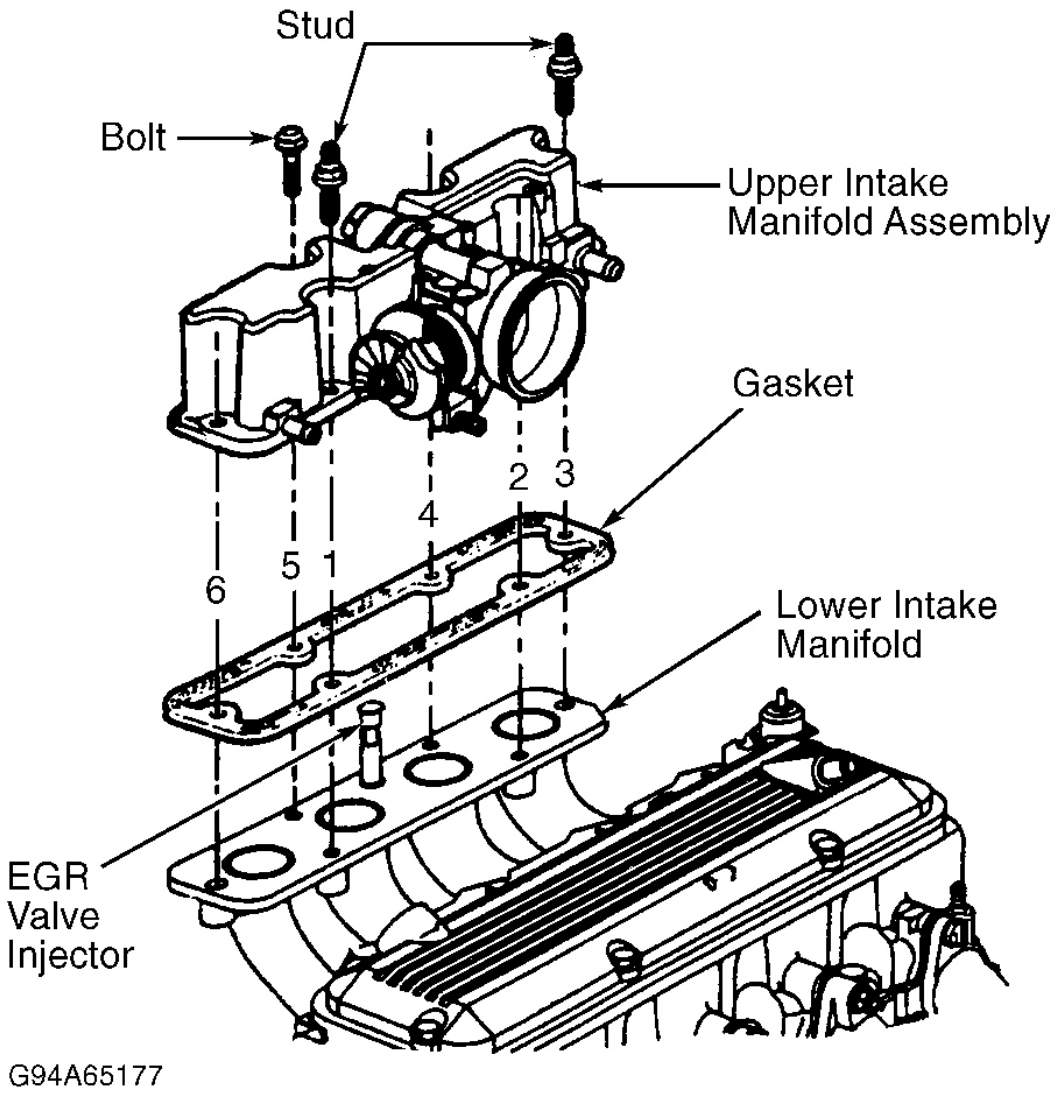


Fig. 3: Upper Intake Manifold Nut Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

EXHAUST MANIFOLD

Removal

Disconnect negative battery cable. Remove air cleaner and duct work. Disconnect oxygen sensor electrical connector. Remove oil fill tube assembly. Disconnect exhaust pipe from exhaust manifold. Remove exhaust manifold nuts. Remove exhaust manifold and gasket.

Installation

To install, reverse removal procedure using NEW gasket. Tighten nuts to specification. See TORQUE SPECIFICATIONS.

CYLINDER HEAD

Removal

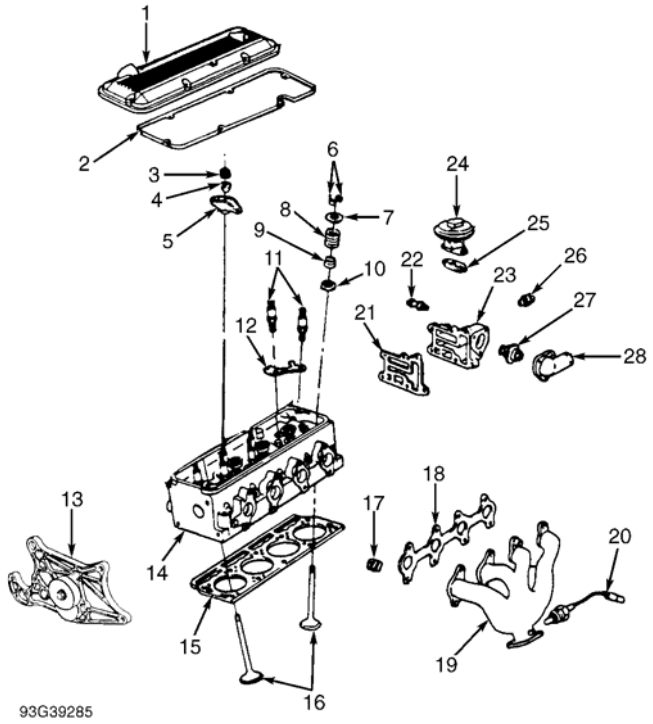
1. Release fuel system pressure. See FUEL PRESSURE RELEASE under REMOVAL & INSTALLATION. Remove air intake duct. Drain cooling system.
2. Disconnect vacuum hoses, electrical connectors and control cables from throttle body. Remove coolant reservoir, serpentine drive belt and alternator.
3. Remove power steering pump (leave hoses connected, and lay pump aside). Remove serpentine drive belt tensioner and spark plug wires. Disconnect canister purge hose, upper radiator hose and heater hoses from intake manifold.
4. Remove intake manifold bracket from power steering bracket. Disconnect fuel lines as necessary. Remove valve cover. Loosen rocker arm nuts, rotate rocker arms to one side and remove push rods.
5. Remove spark plug wire bracket and engine lifting bracket. Disconnect exhaust pipe from exhaust manifold. See **Fig. 4** . Remove cylinder head bolts. Remove transmission fluid level indicator bracket (A/T). Remove cylinder head.

Inspection

Inspect cylinder head for warpage at deck surface and manifold surfaces. DO NOT remove more than .010" (.25 mm) material from cylinder head deck surface.

Installation

1. Ensure cylinder head bolt threads and cylinder block bolt hole threads are clean. Install NEW head gasket over dowel pins, and ensure all holes align with cylinder block.
2. Install cylinder head. Tighten cylinder head bolts to specification in proper sequence. See TORQUE SPECIFICATIONS. See **Fig. 5** . To complete installation, reverse removal procedure. Fill cooling system.



1. Valve Cover
2. Gasket
3. Nut
4. Rocker Arm Ball
5. Rocker Arm
6. Valve Keepers
7. Retainer
8. Spring
9. Valve Stem Seal
10. Valve Spring Seat
11. Rocker Arms Stud
12. Push Rod Guide
13. Drive Belt Tensioner Bracket
14. Cylinder Head
15. Cylinder Head Gasket
16. Valves
17. Coolant Jacket Plug
18. Exhaust Manifold Gasket
19. Exhaust Manifold
20. Oxygen Sensor
21. Gasket
22. Coolant Hose Fitting
23. Coolant Outlet Adapter
24. EGR Valve
25. Gasket
26. Coolant Temperature Sensor
27. Thermostat
28. Coolant Outlet

Fig. 4: Exploded View Of Cylinder Head & Components
Courtesy of GENERAL MOTORS CORP.

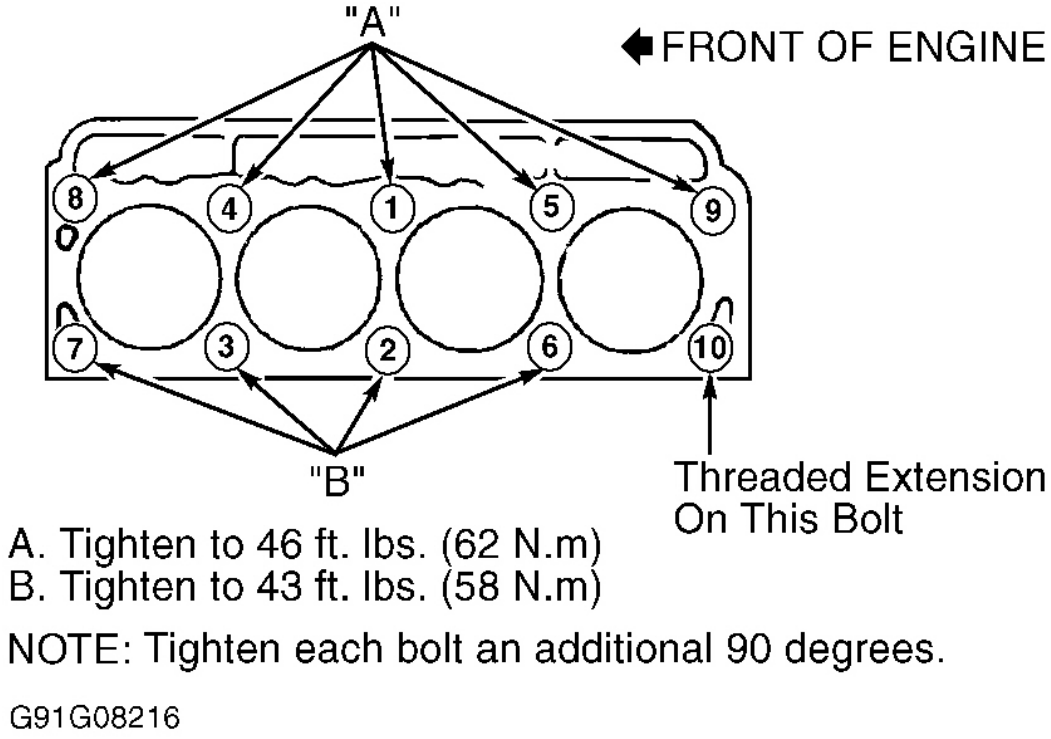


Fig. 5: Cylinder Head Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

FRONT TIMING CASE COVER & FRONT SEAL

Removal

1. Disconnect negative battery cable. Remove P/S reservoir from radiator shroud. Remove upper fan shroud. Remove serpentine belt.
2. Remove generator with brackets and lay aside. Using Hub Puller (J-24420-B), remove crankshaft pulley hub. Remove oil pan. See OIL PAN. Remove front timing case cover bolts, and cover.
3. Using large screwdriver, remove crankshaft front seal. DO NOT distort timing gear cover during seal removal.

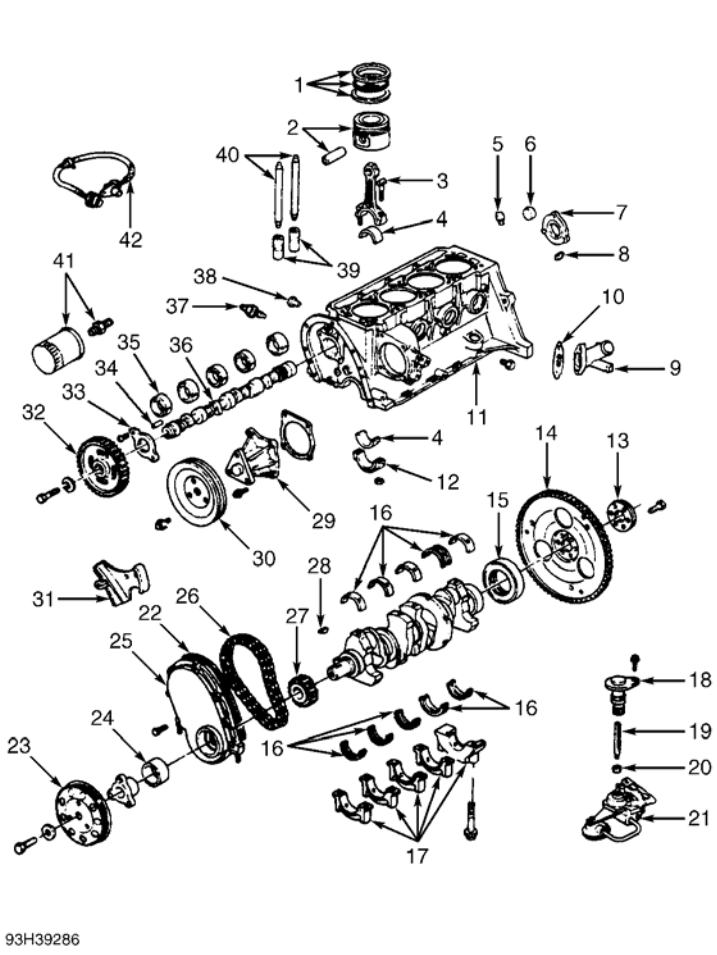
CAUTION: To prevent oil leakage, coat crankshaft pulley hub keyway with RTV sealant before installation.

Installation

1. Lubricate seal lips with engine oil. Using Seal Installer (J-35468), install front cover oil seal into front

cover and leave installer in position. Apply a 3/8" wide by 5/16 thick bead of RTV sealer to oil pan sealing surface and front cover sealing surface. Apply RTV sealant to crankshaft pulley hub keyway.

2. Install crankcase cover with seal installer in place to front of engine. Install and tighten front cover bolts to specification. See TORQUE SPECIFICATIONS. Position crankshaft pulley hub onto crankshaft.
3. Install crankshaft pulley hub using Hub Installer (J-29113), ensuring at least .24" (6.1 mm) of installer bolt thread is engaged into end of crankshaft.
4. To complete installation, reverse removal procedure. Tighten nuts and bolts to specification. See **Fig. 6** . See TORQUE SPECIFICATIONS.



1. Piston Rings
2. Piston & Pin
3. Connecting Rod
4. Connecting Rod Bearing
5. Dowel Pin
6. Coolant Jacket Plug
7. Plug
8. Camshaft Rear Cover
9. Coolant Inlet
10. Gasket
11. Cylinder Block
12. Connecting Rod Cap
13. Flywheel Retainer
14. Flywheel
15. Crankshaft Rear Seal
16. Main Bearings
17. Main Bearing Caps
18. Oil Pump Drive
19. Extension Shaft
20. Retainer
21. Oil Pump
22. Gasket
23. Crankshaft Pulley
24. Front Crankshaft Seal
25. Front Timing Case Cover
26. Timing Chain
27. Crankshaft Sprocket
28. Woodruff Key
29. Water Pump
30. Pulley
31. Timing Chain Tensioner
32. Camshaft Sprocket
33. Camshaft Thrust Plate
34. Camshaft Sprocket Pin
35. Camshaft Bearing
36. Camshaft
37. Oil Pressure Sender & Fuel Pump Switch
38. Oil Filter By-Pass Valve
39. Valve Lifter
40. Push Rod
41. Oil Filter & Adapter
42. Crankshaft Position Sensor

Fig. 6: Exploded View Of Cylinder Block & Components
Courtesy of GENERAL MOTORS CORP.

TIMING CHAIN & SPROCKETS

Removal

1. Remove front timing case cover. See FRONT TIMING CASE COVER. Align camshaft sprocket timing marks and crankshaft sprocket timing marks with tabs on chain tensioner. See **Fig. 7**

2. Loosen timing chain tensioner bolt, but DO NOT remove bolt. Remove camshaft sprocket and timing chain. Using Sprocket Puller (J-22888), remove crankshaft sprocket.

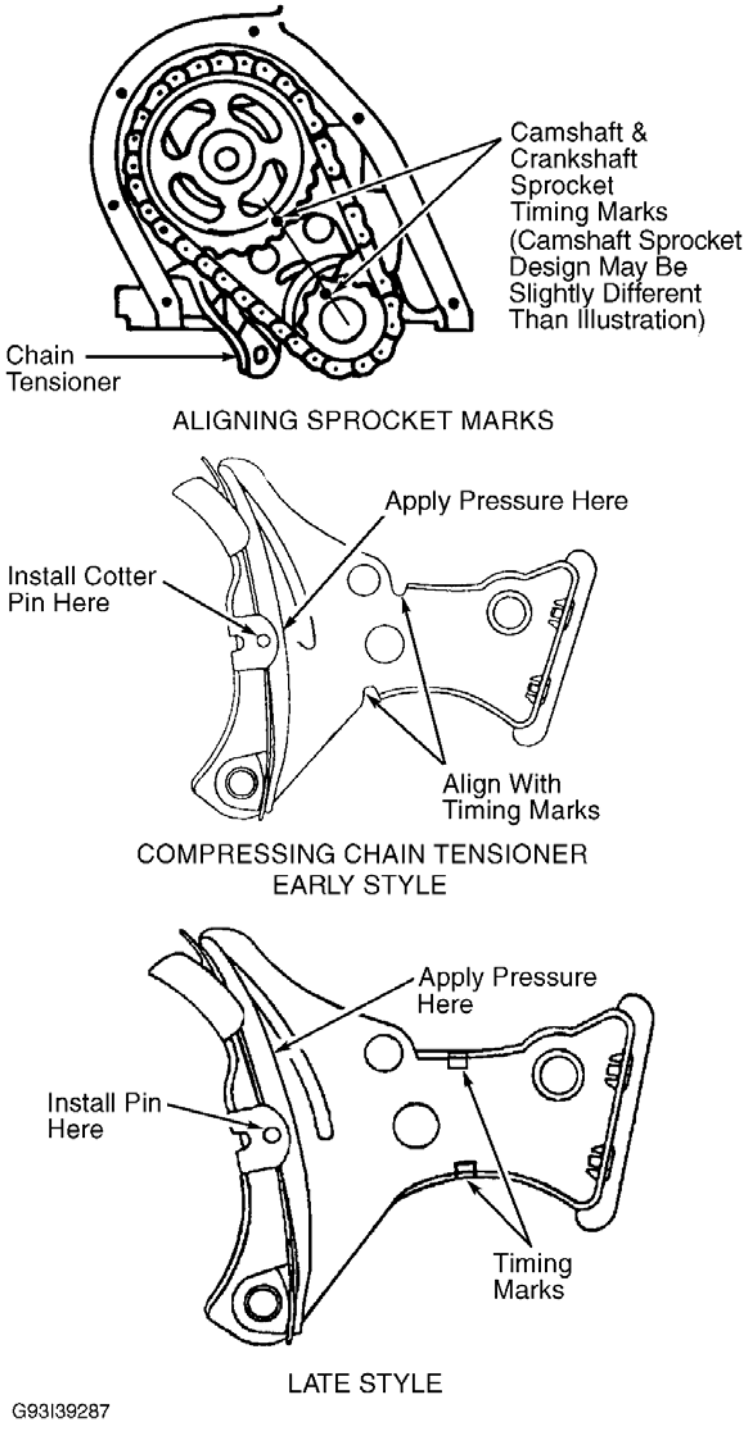


Fig. 7: Aligning Timing Chain Sprockets & Chain Tensioner

Courtesy of GENERAL MOTORS CORP.

Installation

1. Install crankshaft sprocket using Sprocket Installer (J-5590). Ensure crankshaft sprocket is fully seated against crankshaft. Compress chain tensioner spring and install small cotter pin in hole of chain tensioner. See **Fig. 7** .
2. Install timing chain and camshaft sprocket, aligning sprocket marks with tabs on chain tensioner. Ensure hole in camshaft sprocket aligns with camshaft dowel pin. Install camshaft sprocket bolt and tighten to specification. See TORQUE SPECIFICATIONS.
3. Lubricate timing chain with oil. Remove cotter pin from chain tensioner. To complete installation, reverse removal procedure.

VALVE LIFTERS

Removal

1. Release fuel system pressure. See FUEL PRESSURE RELEASE. Remove valve cover. Loosen rocker arm nut, and position rocker arm aside. Remove push rod. Remove rear engine lift bracket.
2. Remove spark plug wires from spark plugs, and route them under intake manifold. Disconnect electrical, fuel and cable connectors from intake manifold. Disconnect exhaust pipe from exhaust manifold. Remove cylinder head bolts/studs.
3. With an assistant, carefully remove cylinder head and manifolds as an assembly. Remove cylinder head gasket. Remove valve lifter from bore in cylinder block. Keep lifters in order to ensure installation in same locations.

NOTE: Verify use of oversize valve lifters by mark on cylinder block near valve lifter bore. If installing new valve lifter, coat bottom of lifter with Camshaft Lubricant (1052365) before installation.

Installation

Install valve lifters in original locations. To complete installation, reverse removal procedure.

CAMSHAFT

NOTE: To replace camshaft, engine must be removed from vehicle.

Removal

1. Remove engine assembly, and mount it on engine stand. See ENGINE. Remove valve lifters. See VALVE LIFTERS.
2. Remove timing chain and camshaft sprocket. See TIMING CHAIN & SPROCKETS. Remove oil pump drive from right side of cylinder block. See **Fig. 6** .
3. Remove camshaft thrust plate. Remove camshaft. If necessary, use Camshaft Bearing Remover/Installer

(J-33049) to remove camshaft bearings.

Inspection

Inspect camshaft journal diameter, lobe lift and oil clearance. Replace components if not within specification. See CAMSHAFT table under ENGINE SPECIFICATIONS.

CAUTION: Replace all lifters if new camshaft is installed. Verify use of oversize valve lifters by mark on cylinder block near valve lifter bore. Add GM EP Lubricant (1051396) to engine oil if camshaft is replaced.

Installation

Install camshaft bearings (if removed), ensuring oil holes are aligned. Coat camshaft journals and bearings with Lubricant (1051396). Install camshaft. Install camshaft thrust plate. To complete installation, reverse removal procedure.

CRANKSHAFT REAR OIL SEAL

Removal

Remove transmission. Remove flexplate/flywheel. See:

TRANSMISSION REMOVAL & INSTALLATION - M/T .

TRANSMISSION REMOVAL & INSTALLATION - A/T .

Pry seal from housing. Use care not to damage sealing surface of crankshaft. Note direction of seal installation.

Installation

1. Coat inner and outer seal surfaces with engine oil. Install seal on mandrel of Seal Installer (J-34686) until dust lip bottoms against tool collar. See **Fig. 8** .
2. Align seal installer dowel pin with alignment hole of crankshaft. Install seal installer on crankshaft. Tighten seal installer bolts to 27-62 INCH lbs. (3-7 N.m).
3. Tighten seal installer handle until collar is even with cylinder block. Remove seal installer. To complete installation, reverse removal procedure. Apply thread locking compound to flexplate/flywheel bolts before installation.

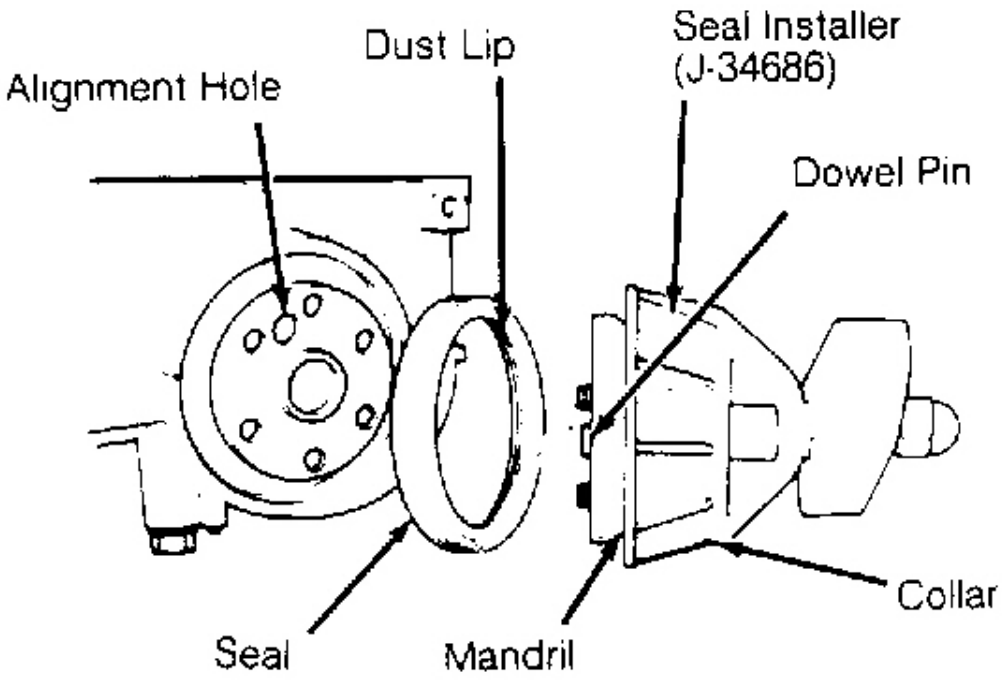


Fig. 8: Installing Rear Crankshaft Seal
Courtesy of GENERAL MOTORS CORP.

WATER PUMP

Removal & Installation

Disconnect negative battery cable. Drain cooling system. Loosen water pump pulley bolts. Remove serpentine drive belt. If necessary, remove alternator and brackets. Remove water pump pulley. Remove water pump and gasket. To install, reverse removal procedure using NEW water pump gasket. Fill cooling system.

OIL PAN

Removal

Disconnect negative battery cable. Raise and support vehicle. Disconnect exhaust pipe from manifold. Drain crankcase. Remove starter bracket from cylinder block. Remove starter, and lay aside. Remove flexplate/flywheel cover. Disconnect and remove oil level sensor (if equipped). Remove oil pan bolts and oil pan.

Installation

Apply a 1/8" bead of RTV sealant to oil pan-to-cylinder block and oil pan-to-front cover sealing surfaces. Apply RTV sealant to ears of NEW oil pan rear seal, and install seal onto bottom of rear main bearing cap. Install oil pan. To complete installation, reverse removal procedure. Fill crankcase.

OVERHAUL

CYLINDER HEAD

Cylinder Head

Inspect cylinder head for warpage at deck surface and manifold surfaces. DO NOT remove more than .010" (.25 mm) material from cylinder head deck surface.

Valve Springs

Measure valve spring free length, out-of-square and tension. See VALVES & VALVE SPRINGS table under ENGINE SPECIFICATIONS. Replace spring if not within specification. Valve spring installed height is not provided by manufacturer.

Valve Stem Oil Seals

If installing oversize valves, use oversize seals. Ensure seal is fully seated on guide. Intake and exhaust seals are different.

Valve Guides

DO NOT knurl valve guides. If valve guide oil clearance is not as specified, ream valve guides for oversize valves. See CYLINDER HEAD table under ENGINE SPECIFICATIONS.

Valve Seat

Measure seat runout and width. See CYLINDER HEAD table under ENGINE SPECIFICATIONS. If not within specification, machine or replace valve seat as necessary. Valve seat replacement procedure not provided by manufacturer.

Valves

Measure valve margin and valve guide oil clearance. See CYLINDER HEAD and VALVE & VALVE SPRINGS tables under ENGINE SPECIFICATIONS. If valve margin is not within specification, machine or replace valve. If valve guide oil clearance is not within specification, replace valve with an oversize valve.

Valve Seat Correction Angles

1. If seat contact is too high (too close to margin), lower it using a 30-degree stone. If seat contact is too low (too close to stem), raise it using a 45-degree stone.
2. If seat is too narrow, widen it using a 45-degree stone. If seat is too wide, narrow it using a 60-degree stone.

CYLINDER BLOCK ASSEMBLY

CAUTION: If piston is to be separated from connecting rod, mark piston in relation to connecting rod before separation. To ensure installation to original locations, mark all parts before disassembly.

Piston & Rod Assembly

Install piston with arrow on top of piston toward front of engine and connecting rod bearing tang slots facing camshaft side of engine.

Fitting Pistons

Measure cylinder bore diameter at center of bore. Measure piston diameter at 90-degree angle to piston pin, .4" (10 mm) above bottom of piston skirt. Determine piston clearance. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS. If piston clearance is not within specification, machine cylinder bore and/or install oversize piston as necessary. See CYLINDER BLOCK table under ENGINE SPECIFICATIONS.

Piston Rings

1. Measure piston ring end gap and side clearance. If end gap and side clearance are not within specification, replace piston rings and/or piston as necessary. See PISTONS, PINS & RINGS table under ENGINE SPECIFICATIONS.
2. Install piston rings with identification mark on ring land facing up. Space ring end gaps around circumference of piston. See **Fig. 9** .

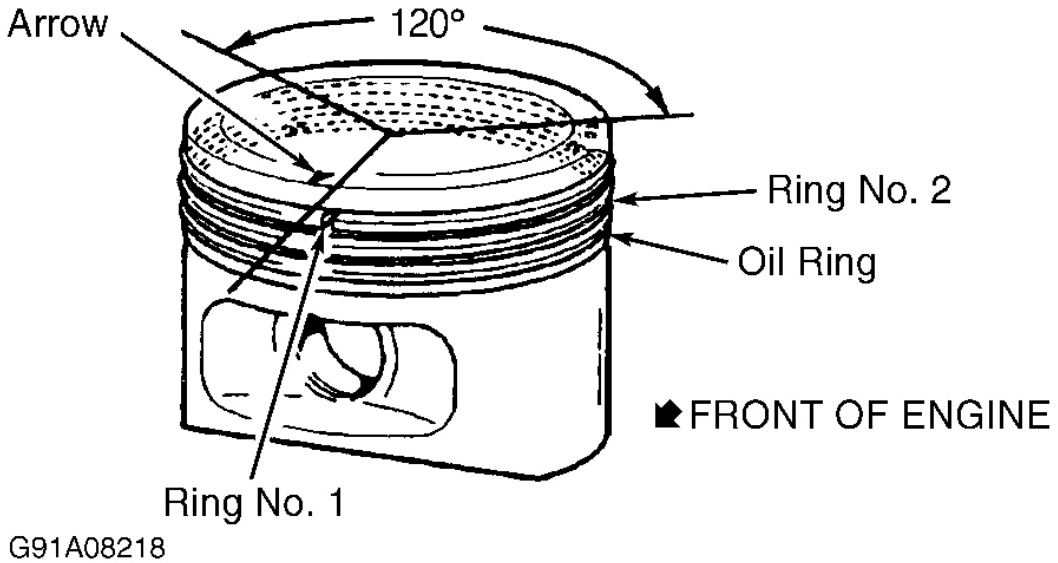


Fig. 9: Positioning Piston Rings
Courtesy of GENERAL MOTORS CORP.

CAUTION: DO NOT shim, scrape or file bearing inserts. DO NOT touch bearing surface with fingers.

Rod Bearings

Measure rod bearing oil clearance. If oil clearance is not within specification, machine crankshaft rod bearing journals and install undersize bearings. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS. Install rod bearing cap onto piston rod with rod bearing tang slots facing camshaft side of engine.

Crankshaft & Main Bearings

Measure crankshaft main bearing oil clearance, out-of-round and taper. If not within specification, machine crankshaft main bearing journals and install undersize bearings. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS. Measure crankshaft end play (thrust bearing wear). See THRUST BEARING.

Thrust Bearing

No. 4 main bearing is thrust bearing. Pry crankshaft toward rear of engine. Measure clearance between thrust bearing face and crankshaft. Clearance should be .002-.007" (.05-.18 mm).

Cylinder Block

Measure deck surface warpage. DO NOT remove more than .010" (.25 mm) material from deck surface.

Valve Lifter Bores

Oversize valve lifters are available. Oversize lifter should be indicated on cylinder block near lifter bore.

LUBRICATION

ENGINE OILING SYSTEM

Description

A camshaft-driven, gear-type oil pump is mounted at bottom of cylinder block and is accessible with oil pan removed. Oil pump supplies pressurized oil to internal passages of cylinder block. Internal passages intersect with hydraulic valve lifter bosses where oil flows to main and camshaft bearings and lifters. See **Fig. 10** .

Crankcase Capacity

Engine oil capacity is about 4 qts. (3.8L) without oil filter change. When changing oil filter, add more oil if necessary.

Oil Pressure

Normal oil pressure is 56 psi (3.9 kg/cm^2) at 3000 RPM.

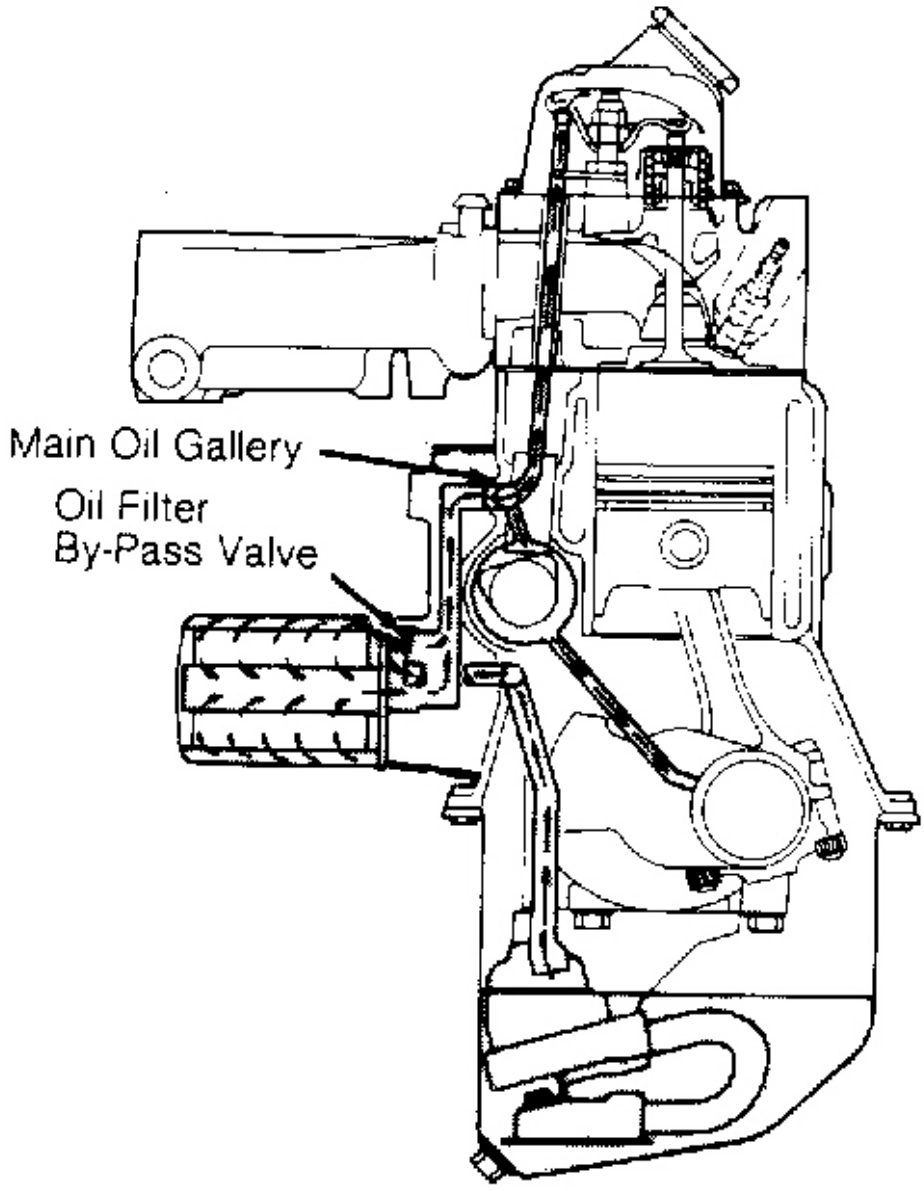


Fig. 10: Cross-Sectional View Of Engine Oil Circuit
Courtesy of GENERAL MOTORS CORP.

OIL PUMP

Removal & Disassembly

Remove oil pan. See OIL PAN under REMOVAL & INSTALLATION. Remove oil pump-to-rear main bearing cap bolt. Remove oil pump and extension shaft. Remove extension shaft and retainer from oil pump. Disassemble oil pump. DO NOT remove pick-up tube unless loose or broken.

Inspection

1. Ensure retainer is not cracked. Inspect components for damage. Measure gear housing pocket depth and diameter, gear diameter and gear length.
2. Measure gear lash between teeth of both gears and gear side clearance between tip of each gear tooth and housing pocket. Using straightedge and feeler gauge, measure gear end clearance.
3. Determine clearance between pressure regulator valve and bore. Replace components if not within specification. See OIL PUMP SPECIFICATIONS table.

CAUTION: To ensure pump priming, pack all pump cavities with petroleum jelly before gear installation. Use only original equipment gaskets when assembling oil pump, as gasket thickness is critical. Pick-up tube must be replaced if removed.

Reassembly & Installation

To reassemble, reverse disassembly procedure. Replace pick-up tube if removed. Apply Sealant (1050026) to new tube before installing. Install pick-up tube using Tube Installer (J-8369). To complete installation, reverse removal procedure. Tighten oil pump bolt to specification. See TORQUE SPECIFICATIONS.

OIL PUMP SPECIFICATIONS

Application	In. (mm)
Gear	
Diameter	1.498-1.500 (38.05-38.10)
End Clearance	.002-.007 (.05-.18)
Lash	.004-.008 (.10-.20)
Length	1.199-1.200 (30.45-30.48)
Side Clearance	.0015-.0040 (.038-.102)
Gear Housing Pocket	
Depth	1.195-1.198 (30.36-30.44)
Diameter	1.503-1.506 (38.18-38.25)
Valve-To-Bore Clearance	.0015-.0035 (.038-.089)

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

1994 Chevrolet S10 Pickup

2.2L 4-CYL - VIN [4] 1994 GENERAL MOTORS ENGINES 2.2L 4-Cylinder

Application	Ft. Lbs. (N.m)
A/C Compressor Bracket-To-Engine Bolt	50 (37)
Camshaft Sprocket Bolt	77 (105)
Connecting Rod Nut	38 (52)
Crankshaft Pulley Bolt	37 (50)
Crankshaft Pulley Hub Bolt	77 (105)
Cylinder Head Bolt (1)	
Step 1	
Head Bolt (Long)	46 (63)
Head Bolt (Short)	43 (58)
Step 2	Additional 90 Degrees
Engine Mounts (Front) (2)	
Mount-To-Engine Bolt	39 (53)
Bracket-To-Mount Through-Bolt	38 (51)
Bracket-To-Frame Bolt	33 (45)
Exhaust Pipe-To-Manifold Nut	18 (25)
Flexplate/Flywheel-To-Crankshaft Bolt (3)	55 (75)
Intake Manifold Nut (4)	
Lower	24 (32)
Upper	22 (30)
Main Bearing Cap Bolt	70 (95)
Oil Pump Drive Bolt	18 (25)
Oil Pump Bolt	32 (43)
Oxygen Sensor	30 (41)
Rear Engine Mount	
Mount-To-Frame	33 (45)
Mount-To-Transmission	33 (45)
Rocker Arm Nut	22 (30)
Serpentine Belt Tensioner Pulley Bolt	63 (85)
Timing Chain Tensioner Bolt	17 (23)
Water Pump Bolt	18 (25)
Water Pump Inlet	18 (25)
	INCH Lbs. (N.m)
Camshaft Thrust Plate Bolt	106 (12)
Front Timing Case Cover Bolt	97 (11)
Exhaust Manifold Nut	115 (13)
Front Engine Mount Shield	97 (11)
Oil Pan Bolt	89 (10)
Oil Pump Cover Bolt	89 (10)

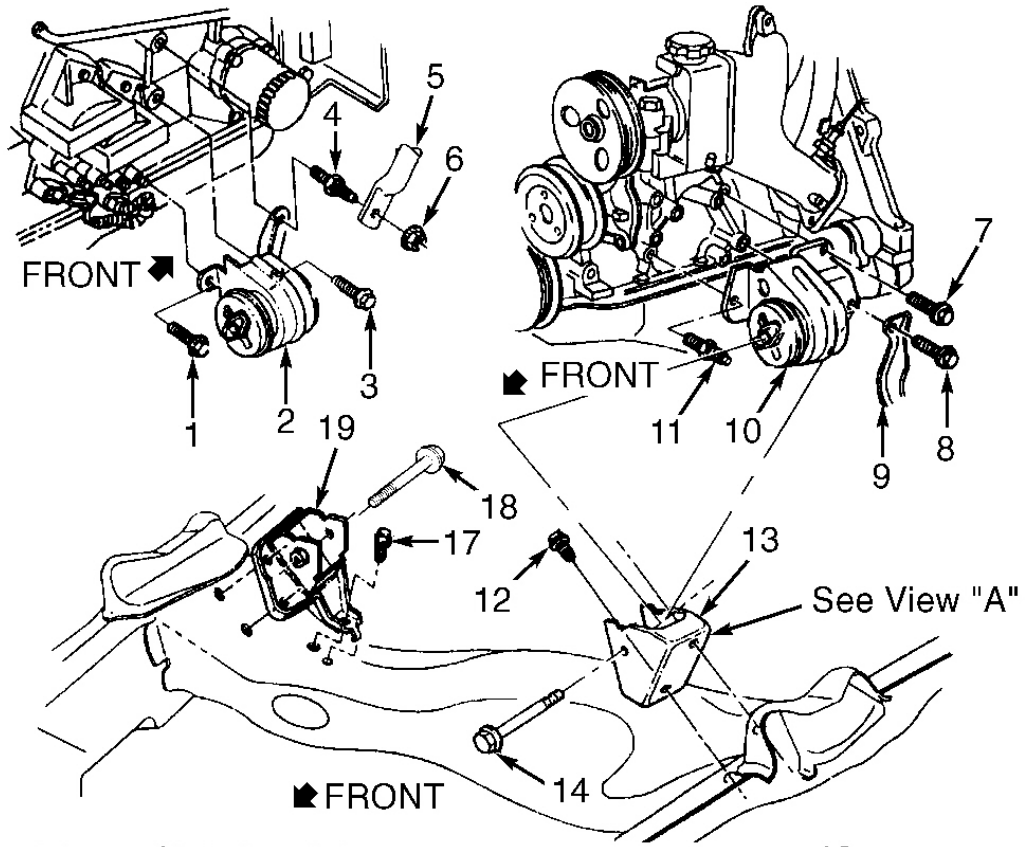
Valve Cover Bolt	89 (10)

(1) Tighten in sequence. See **Fig. 5** .

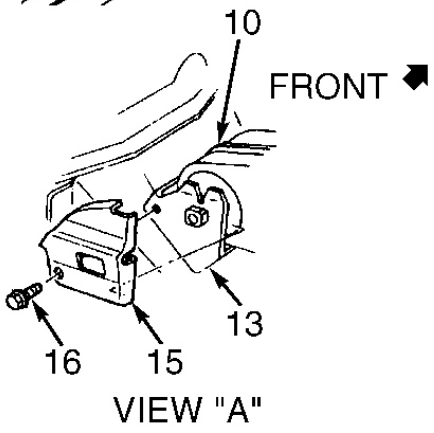
(2) See **Fig. 11** and **Fig. 12** .

(3) Apply thread locking compound to bolts.

(4) Tighten in sequence. See **Fig. 2** and **Fig. 3** .



1. Bolts - 39 ft. lbs. (53 N.m)
2. RH Engine Mount Assembly
3. Bolt - 39 ft. lbs. (53 N.m)
4. Stud - 39 ft. lbs. (53 N.m)
5. Bracket
6. Nut - 37 ft. lbs. (50 N.m)
7. Bolt - 39 ft. lbs. (53 N.m)
8. Bolts - 39 ft. lbs. (53 N.m)
9. Brace
10. LH Engine Mount Assembly
11. Stud - 39 ft. lbs. (53 N.m)
12. Bolt - 33 ft. lbs. (45 N.m)
13. LH Bracket Assembly
14. Bolt - 38 ft. lbs. (51 N.m)
15. Shield
16. Bolt - 97 INCH. lbs. (11 N.m)

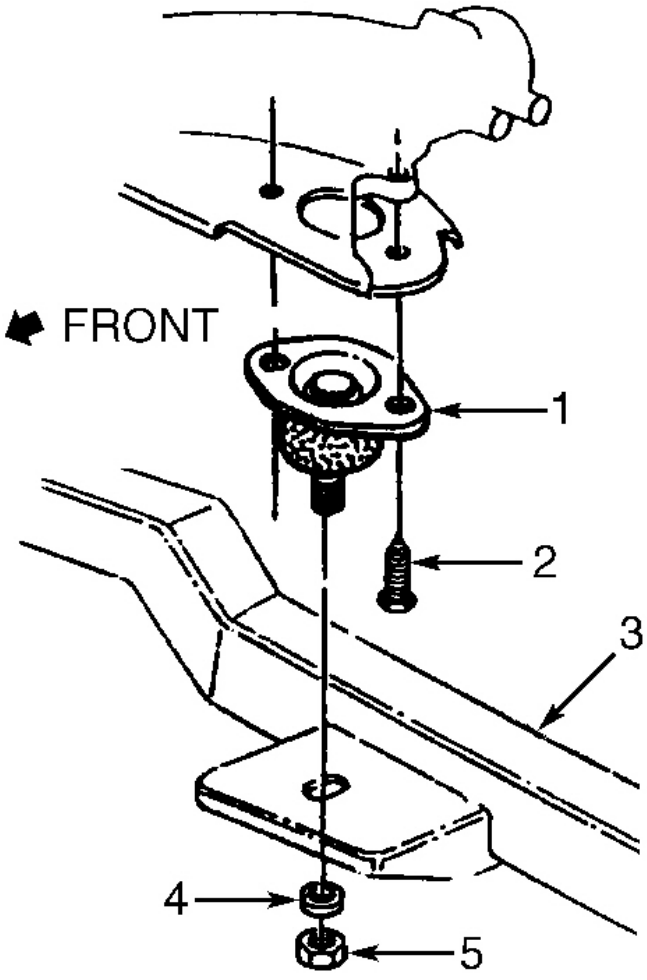


VIEW "A"

17. Bolt - 33 ft. lbs. (45 N.m)
18. Bolt - 38 ft. lbs. (51 N.m)
19. RH Engine Mount Assembly

G94B65210

Fig. 11: Tightening Engine Mount Bolts (Front)
Courtesy of GENERAL MOTORS CORP.



1. Rear Engine Mount (Transmission)
2. Bolt – 33 ft. lbs. (45 N.m)
3. Transmission Support
4. Washer
5. Nut – 33 ft. lbs. (45 N.m)

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Fig. 12: Tightening Engine Mount Bolts (Rear)
Courtesy of GENERAL MOTORS CORP.

ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Application	Specification
Displacement	134 Cu. In. (2.2L)
Bore	3.50" (89.0 mm)
Stroke	3.46" (88.0 mm)
Compression Ratio	8.85:1
Fuel System	MFI
Horsepower @ RPM	118 @ 5200
Torque Ft. Lbs. @ RPM	130 @ 2800

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS

Application	In. (mm)
Crankshaft End Play	.002-.007 (.05-.18)
Main Bearings	
Journal Diameter	2.4945-2.4954 (63.360-63.384)
Journal Out-Of-Round	.0002 (.005)
Journal Taper	.0002 (.005)
Oil Clearance	.0006-.0019 (.015-.047)
Connecting Rod Bearings	
Journal Diameter	1.9983-1.9994 (50.758-50.784)
Journal Out-Of-Round	.0002 (.005)
Journal Taper	.0002 (.005)
Oil Clearance	.0010-.0031 (.025-.079)

CONNECTING RODS SPECIFICATIONS

CONNECTING RODS SPECIFICATIONS

Application	In. (mm)
Maximum Bend	(1)
Maximum Twist	(1)
Side Play	.004-.015 (.10-.38)

(1) Replace rod if any bend or twist exists.

PISTONS, PINS & RINGS SPECIFICATIONS

PISTONS, PINS & RINGS SPECIFICATIONS

Application	In. (mm)
Piston Clearance	.0006-.0017 (.015-.047)
Pins	
Diameter	.8000-.8002 (20.320-20.325)
Piston Fit	.0004-.0009 (.010-.022)
Rod Fit	.0010-.0017 (.025-.045)
Rings	
No. 1 & 2	
End Gap	.010-.020 (.25-.50)
Side Clearance	.002-.003 (.05-.07)
No. 3 (Oil)	
End Gap	.010-.050 (.25-1.27)
Side Clearance	.002-.008 (.05-.21)

CYLINDER BLOCK SPECIFICATIONS

CYLINDER BLOCK SPECIFICATIONS

Application	In. (mm)
Cylinder Bore	
Standard Diameter	3.5036-3.5043 (88.991-89.009)
Maximum Taper	.0005 (.013)
Maximum Out-Of-Round	.0005 (.013)
Maximum Deck Warpage	(1)
(1) If more than .010" (.25 mm) material must be removed from original surface of deck, replace cylinder block.	

VALVES & VALVE SPRINGS SPECIFICATIONS

VALVES & VALVE SPRINGS SPECIFICATIONS

Application	Specification
Valves	
Face Angle	45°
Minimum Margin	.031" (.80 mm)
Valve Springs	
Free Length	1.89" (48.0 mm)
Out-Of-Square	.63" (1.6 mm)
Pressure (1)	
Valve Closed	79-85 @ 1.64 (35-38 @ 41.6)
Valve Open	225-233 @ 1.25 (102-106 @ 31.7)
Lbs. @ In. (Kg @ mm).	

(1)

CYLINDER HEAD SPECIFICATIONS

CYLINDER HEAD SPECIFICATIONS

Application	Specification
Maximum Warpage	(1)
Valve Seats	
Intake Valve	
Seat Angle	46°
Seat Width	.049-.059" (1.25-1.50 mm)
Maximum Seat Runout	.002" (.05 mm)
Exhaust Valve	
Seat Angle	46°
Seat Width	.063-.075" (1.60-1.91 mm)
Maximum Seat Runout	.002" (.05 mm)
Valve Guide Oil Clearance	
Intake Valve	.0011-.0026" (.028-.066 mm)
Exhaust Valve	.0014-.0031" (.035-.081 mm)

(1) If more than .010" (.25 mm) material must be removed from original surface of cylinder head, replace cylinder head.

CAMSHAFT SPECIFICATIONS

CAMSHAFT SPECIFICATIONS

Application	In. (mm)
Journal Diameter	1.867-1.869 (47.44-47.49)
Lobe Lift	
Intake	.259 (6.60)
Exhaust	.250 (6.35)
Oil Clearance	.001-.004 (.03-.10)